The algorithm that is actually implemented is based on the work of Quintiere and Cleary used to develop a model for the room corner test. The decision was made to go with this simple model of flame spread because problems were found with the Dietenberger model that would take too long to track down in the time given.

The Quintiere-Cleary model is based on five simple differential equations. One each for concurrent, eq. (155), and opposed flow flame spread, eq. (156). One each, eqs. (158) and (157) for the two burnout fronts and the last one for burn out at the ignition point (159).

$$\frac{dy_p}{dt} = \frac{y_f - y_p}{\frac{\pi}{4} k\rho c [\frac{T_{ig} - T_s}{\dot{q}_f''}]^2} \tag{1}$$

$$\frac{dx_p}{dt} = \frac{\phi}{k\rho c (T_{ig} - T_s)^2}, \; for \; T_s \geq T_{s,\min} \tag{2}$$

$$\frac{dy_b}{dt} = \frac{\dot{Q}''(y_p - y_b)}{Q_{TOT}''} \tag{3}$$

$$\frac{dx_b}{dt} = \frac{\dot{Q}''(x_p - x_b)}{Q_{TOT}''} \tag{4}$$

and

$$\frac{dQ''}{dt} = \frac{(\dot{q}_f'' - \sigma T_{ig}^4 + \sigma T_{layer}^4)}{\Delta L} \Delta H \tag{5}$$

The equations describe the growth of two rectangles. At ignition a single rectangle, R_p, is defined and its growth is determined by eq. (155) for spread up the wall and eq. (156) for lateral spread as well as spread down the wall. When $Q'' \leq 0$ a second rectangle, R_b, the same size as R_p was originally starts growing. It is governed by eqs. (158) and (157). After R_b starts to be tracked the pyrolysis area is $R_p - R_b$.

When a flame spread object is defined, CFAST adds five additional differential equations to the

equation set. A target is also placed at the specified location on the specified wall surface and the maximum time step is set to be 1 s. This allows the temperature of the target to be tracked and the ignition temperature and time to be calculated,

Once a flame spread object ignites, its mass loss, heat release rate, and other outputs are calculated. The results are then treated like any other object fire by CFAST to allow for consistency.